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10/574,032	03/27/2006	Osamu Shimamura	NNA-248-B	8018

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EXAMINER	
ARCIERO, ADAM A	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
11/05/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/574,032	SHIMAMURA ET AL.	
	Examiner	Art Unit	
	ADAM A. ARCIERO	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 October 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-16 and 20-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-16 and 20-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

LITHIUM-ION BATTER AND METHOD FOR ITS MANUFACTURE

Examiner: Adam Arciero S.N. 10/574,032 Art Unit: 1795 October 29, 2009

DETAILED ACTION

1. The Applicant's request for reconsideration filed on October 19, 2009 was received.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

3. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over HISAMITSU et al. and DELNICK on claims 1, 4-6, 8-14 and 20-23 are maintained.

As to Claims 1, 6, 8, 20 and 22, HISAMITSU et al. teaches of a lithium ion battery (pg. 4, [0044]) comprising an anode, cathode and an electrolyte layer (Abstract). HISAMITSU et al. further teaches using an ink-jet method for forming all of the layers of the battery including the electrolyte layer (pg. 3, [0038]-[0039]). HISAMITSU et al. does not specifically disclose wherein the electrolyte layer consists of a pattern of individual insulating particles which electrolytes occupying the interstitial spaces.

However, DELNICK discloses a battery comprising a cathode, an anode, and an electrolyte layer provided between said cathode and anode. Said electrolyte layer comprises a porous separator structure comprising individual insulating particles of silica or alumina and a polymer binder (col. 5, lines 36-57) wherein electrolytes are applied via ink-jet printing so as to

uniformly occupy the interstitial spaces of the porous separator structure (Abstract). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the battery of HISAMITSU et al. with the separator having electrolytes occupying the interstitial spaces thereof, because DELNICK teaches that ink-jet method allows for the electrolyte to be uniformly and accurately distributed throughout the pore structure of the separator thereby allowing for a simplified manufacturing process (Abstract). Furthermore, it is the position of the Examiner that the electrolyte layer of DELNICK produced by the method of HISAMITSU et al. would inherently consist essentially of a pattern of insulating particles comprising a plurality of interstitial spaces therebetween, wherein electrolytes occupy a majority of the interstitial spaces, given that the materials and method of making of DELNICK, HISAMITSU et al. and the present application are the same. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

As to Claim 4, HISAMITSU et al. teaches that it is preferable to have particle sizes of all the consistent materials for the battery, which are produced via ink-jet method, to be 5 microns or smaller (pg. 4, [0048]).

As to Claim 5, HISAMITSU et al. does not specifically disclose the thickness of the electrolyte layer.

However, DELNICK discloses wherein the thickness of the electrolyte layer is between 5-20 microns (col. 5, lines 36-57). The courts have held that in the case wherein the claimed

ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

As to Claim 9, HISAMITSU et al. discloses wherein the positive electrode comprises a lithium-transition metal composite oxide and the anode comprises carbon (pg. 4, [0044]-[0045]).

As to Claims 10 and 13, HISAMITSU et al. discloses a polymeric electrolyte comprising PEO and NMP (pg. 4, [0047]). HISAMITSU et al. does not specifically disclose the claimed method.

However, DELNICK discloses applying the separator comprising individual insulating particles of alumina and silica onto at least the cathode or the anode, and further filling the interstitial spaces of said separator with the electrolyte via an ink-jet method (col. 4, lines 4-10). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the method of manufacturing a battery of HISAMITSU et al. with that of DELNICK, because DELNICK teaches that the volume and distribution of electrolytes through a separator can be accurately and uniformly controlled in such a manner (Abstract).

As to Claim 11, HISAMITSU et al. discloses using ink-jet printing as a method for manufacturing a battery (pg. 3, [0038]-[0039]).\

As to Claim 12, HISAMITSU et al. discloses wherein the battery components can be simultaneously printed as required, via ink-jet printing (pg. 5, [0058]).

As to Claim 14, HISAMITSU et al. does not specifically disclose the thickness of the electrolyte layer.

However, DELNICK discloses wherein the thickness of the electrolyte layer is between 5-20 microns (col. 5, lines 36-57). The courts have held that in the case wherein the claimed

ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

As to Claim 20, HISAMITSU et al. discloses wherein the ink-jet printing method of the battery components allows for patterns to be produced (pg. 5, [0058]).

As to Claims 21 and 23, the combination of HISAMITSU et al. and DELNICK does not expressly disclose the patterns claimed by the applicant. However, the courts have held that the configuration of the pattern is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed patterns was significant, *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) (MPEP 2144.01).

4. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over HISAMITSU et al., DELNICK and KUNG on claim 3 is maintained.

As to Claim 3, HISAMITSU et al. and DELNICK does not specifically disclose the porosity (void ratio) of the electrolyte layer.

However, KUNG teaches of a separator comprising alumina particles (claim 3), wherein the porosity is controlled so as to be form 40-90% (Claim 4). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the separator of HISAMITSU et al. and DELNICK so as to have a porosity of 40-90%, because KUNG teaches that having a separator with such a porosity allows for greater electrolyte retention capabilities which increases battery life col. 1, lines 18-21).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over HISAMITSU et al. (US 2004/0126655 A1) in view of DELNICK (US 5,865,860) as applied to claims 1, 4-6, 8-14 and 20-23 above, and further in view of MUNSHI (US 6,645,675 B1).

As to Claim 7, the disclosure of HISAMITSU et al. as discussed above in claim 1 is incorporated herein. HISAMITSU et al. does not expressly disclose the battery according to claim 1 wherein the individual insulating particles comprise olefin resins.

However, MUNSHI teaches a state of the art lithium ion battery using a carbon electrode as the anode and a lithiated metal oxide as the cathode. A microporous separator of polypropylene or polyethylene (olefin resin) is used for separating the two electrodes, with an electrolyte comprised of a lithium salt and a liquid organic solvent usually absorbed into said separator (col. 1, lines 43-54). At the time of the invention, it would have been obvious to one of ordinary skill in the art to substitute a microporous separator comprising a polyolefin resin such as polyethylene, as taught by MUNSHI, for the electrolyte layer of HISAMITSU et al. and DELNICK, because polyethylene is well known for being a great insulator for the electrodes and absorber of electrolyte for lithium-ion batteries and the substitution of one known element (separator comprising an olefin resin) for another (separator comprising alumina) would have yielded the predictable results.

6. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over HISAMITSU et al., DELNICK and TRIPLETT on claims 15-16, 24-27 are maintained.

As to Claims 15-16, 24 and 26, TRIPLETT teaches an electric vehicle driven by an electric motor which is powered by a DC battery having a plurality of cells (battery assembly)

(Abstract). TRIPLETT does not specifically disclose the electrolyte layer claimed in claims 15-16.

However, DELNICK discloses a battery comprising a cathode, an anode, and an electrolyte layer provided between said cathode and anode. Said electrolyte layer comprises a porous separator structure comprising individual insulating particles of silica or alumina and a polymer binder (col. 5, lines 36-57) wherein electrolytes are applied via ink-jet printing so as to uniformly occupy the interstitial spaces of the porous separator structure (Abstract). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the electric vehicle comprising a plurality of batteries of TRIPLETT with the separator having electrolytes occupying the interstitial spaces thereof, because DELNICK teaches that providing an electrolyte layer made by an ink-jet method allows for the electrolyte to be uniformly and accurately distributed throughout the pore structure of the separator thereby allowing for a simplified manufacturing process (Abstract). DELNICK does not specifically disclose wherein the electrolyte layer consists essentially of individual insulating particles individually applied directly to at least one of the cathode and the anode.

However, HISAMITSU et al. teaches of a lithium ion battery (pg. 4, [0044]) comprising an anode, cathode and an electrolyte layer (Abstract). HISAMITSU et al. further teaches using an ink-jet method for forming all of the layers of the battery including the electrolyte layer (pg. 3, [0038]-[0039]). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the separator of DELNICK by forming said separator comprising insulating particles by an ink-jet method, because HISAMITSU et al. teaches that patterns, shape and size of the battery components (such as separator) can be freely and easily controlled (pg. 5,

[0058]). Furthermore, it is the position of the Examiner that the electrolyte layer of DELNICK produced by the method of HISAMITSU et al. would inherently consist essentially of a pattern of insulating particles comprising a plurality of interstitial spaces therebetween, wherein electrolytes occupy a majority of the interstitial spaces, given that the materials and method of making of DELNICK, HISAMITSU et al. and the present application are the same. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999). The combination does not expressly disclose the battery assembly as being capable for powering a vehicle.

As to Claims 25 and 27, the combination of TRIPLETT, DELNICK and HISAMITSU et al. does not expressly disclose the patterns claimed by the applicant. However, the courts have held that the configuration of the pattern is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed patterns was significant, *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) (MPEP 2144.01).

Response to Arguments

7. Applicant's arguments filed October 19, 2009 have been fully considered but they are not persuasive.

Applicant's principal arguments are:

a) Delnick does not disclose individual insulating particles having a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces. Each insulating particle in the pattern is selectively arranged directly on one of the cathode or anode, separating said cathode from said anode (Claim 1).

b) Hisamitsu does not disclose the use of insulating particles that have a mean radius of 0.05-10 microns (claim 4).

c) Delnick does not disclose the thickness of the electrolyte layer, but rather the separator layer (claim 5).

d) Delnick does not disclose applying individual insulating particles in a patterned arrangement (claim 20).

e) Hisamitsu and Delnick do not reach or suggest the method of claim 10 (claim 10).

f) Hisamitsu and Delnick fail to teach applying the electrolytic polymer at the same time with the insulating particles (claim 12).

In response to Applicant's arguments, please consider the following comments.

a) Hisamitsu et al. teaches of a lithium ion battery wherein an ink-jet printing method is used for forming all layers of said battery (pg. 3, [0038]-[0039]). Hisamitsu et al. further discloses that the layers formed by the ink-jet method are formed in predetermined patterns (pg. 3, [0039]). Delnick teaches of an electrolyte layer, comprising a separator structure (separates anode from cathode) comprising a plurality of individual insulating particles (col. 5, lines 36-57). Delnick further teaches that said separator can be manufactured by any well known technique in the art, such as the ink-jet printing method disclosed by Hisamitsu et al. The electrolyte layer of Delnick produced by the method of Hisamitsu et al. would inherently consist of a pattern of

insulating particles comprising a plurality of interstitial spaces therebetween, given that the materials and method disclosed by Hisamitsu et al. and Delnick and the present invention are same.

b) Delnick was used to modify the teachings of Hisamitsu to teach the reason for using insulating particles in an electrolyte layer. Hisamitsu discloses a method for forming an electrolyte layer via ink-jet method and further teaches that the particle size be 5 microns or smaller so that no clogging occurs within the ink-jet nozzles.

c) Delnick discloses the thickness of a separator layer as being 5-20 microns thick wherein said separator layer comprises a uniform filling of electrolyte.

d) Hisamitsu et al. discloses using an ink-jet method for forming an electrolyte layer in a predetermined pattern. Delnick teaches an electrolyte layer comprising the same materials recited in claim 1.

e) Hisamitsu et al. discloses applying a separator layer directly to a cathode or anode. Delnick teaches individual insulating particles for a separator layer and applying an electrolytic polymer to some of the interstitial spaces.

f) Hisamitsu et al. discloses wherein the battery components (including separator layer and electrolyte) can be applied simultaneously.

Conclusion

8. Applicant's amendment filed May 29, 2009 necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADAM A. ARCIERO whose telephone number is (571)270-5116. The examiner can normally be reached on Monday to Friday 8am to 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AA

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1795